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RESEARCH ARTICLE

Health and Academic Achievement: Cumulative Effects of Health Assets on Standardized Test Scores Among Urban Youth in the United States*

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ABSTRACT

BACKGROUND: The Institute of Medicine (2012) concluded that we must "*strengthen schools as the heart of health*." To intervene for better outcomes in both health and academic achievement, identifying factors that impact children is essential. Study objectives are to (1) document associations between health assets and academic achievement, and (2) examine cumulative effects of these assets on academic achievement.

METHODS: Participants include 940 students (grades 5 and 6) from 12 schools randomly selected from an urban district. Data include physical assessments, fitness testing, surveys, and district records. Fourteen health indicators were gathered including physical health (eg, body mass index [BMI]), health behaviors (eg, meeting recommendations for fruit/vegetable consumption), family environment (eg, family meals), and psychological well-being (eg, sleep quality). Data were collected 3-6 months prior to standardized testing.

RESULTS: On average, students reported 7.1 health assets out of 14. Those with more health assets were more likely to be at goal for standardized tests (reading/writing/mathematics), and students with the most health assets were 2.2 times more likely to achieve goal compared with students with the fewest health assets (both $p < .001$).

CONCLUSIONS: Schools that utilize nontraditional instructional strategies to improve student health may also improve academic achievement, closing equity gaps in both health and academic achievement.

Keywords: academic achievement; health behavior; health assets; nutrition; physical activity; preadolescence; risk factors; smoking.

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Reducing inequalities in health[1] and academic achievement[2] are national priorities. To design interventions to achieve these goals, it is essential to identify factors that influence both student health and learning. However, the association between health and achievement is complex. There is evidence that health and achievement can be bidirectional: children with disabilities and chronic conditions attain lower academic achievement, and those with poor academic achievement are more likely as children and adults to have morbidities and premature mortality.[3] In addition, there are underlying conditions that affect both health and achievement such as early school readiness, poverty, and family structure.

There is currently limited, but suggestive, research documenting associations between health assets, cognitive function and academic achievement.[4,5] Specifically, previous research found an association of nutrition and physical activity with higher

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academic performance.[6] Overweight and hypertension are associated with decreased cognitive function,[7-9] and overweight is associated with poorer school performance.[7,10] In contrast, higher levels of physical activity have been associated with better cognitive function, such as enhanced concentration and memory.[11-13] Results of a recent trial demonstrated that overweight students randomized to a 13-week exercise program exhibited dose-response benefits of exercise on executive function and mathematics achievement as well as preliminary evidence of enhanced brain activity measured via functional magnetic resonance imaging (MRI).[14]

Despite these provocative findings, studies to date have focused only on children with chronic conditions or examine effects of just one health risk factor (eg, obesity) on academic achievement. Moreover, academic achievement is sometimes measured through self-reported grades rather than objective indicators such as standardized tests.[4,5,11,15]

Promoting health may seem an added burden when schools' primary focus is to meet academic standards. However, schools are an ideal environment to promote health.[16,17] About 56 million American children are enrolled in public schools, spending approximately one-half of waking hours there.[18] Moreover, 31 million participate in the National School Lunch Program.[19] Opinion polls indicate strong support for mandating healthier school food.[20] In addition, schools can be a context where children can learn and practice positive health behaviors within a health-promoting environment. In a May 2012 report, *Accelerating Progress in Obesity Prevention*, the Institute of Medicine evaluated obesity prevention strategies and concluded that we must ''strengthen schools as the heart of health.''[21] Given the effort required to make school policy changes to influence health, research is needed to test the premise that promoting student health will also support academic achievement.

The aim of this study is to explore the association between health and academic achievement by examining a set of common modifiable health assets that have known protective effects against chronic disease. We focused on children in 5th and 6th grade, a time of great transition associated with declines in academic achievement predictive of future academic failure and dropout.[22] It is also during these preadolescent years when obesity rates nearly double,[23] and children begin to develop independent dietary and exercise habits.[24] Objectives of this study are to (1) document associations between a variety of health assets and academic achievement; and (2) examine cumulative effects of health assets on academic achievement. This study extends prior research by including a large and racial/ethnically diverse sample of young children in an urban school district, incorporating objective health indicators and standardized test scores, and examining the individual and cumulative effect of multiple health assets. We seek to understand the association between health assets and academic achievement to inform efforts to reduce inequalities in both academic achievement and student health.

METHODS

This study is affiliated with the Oxford Health Alliance community-based study to prevent chronic diseases: Community Interventions for Health.[25,26] The focus is on 3 underlying behavioral risk factors for chronic disease—nutrition, physical activity, and smoking—assessed within the social and environmental context in which people live, work, and attend school. Data were collected in 2009 by the Community Alliance for Research and Engagement at the Yale School of Public Health in partnership with the New Haven Public Schools.

Study Sites and Participants

Twelve K-8 schools were randomly selected from a total of 27 schools in New Haven, Connecticut, a medium-sized urban school district, and all agreed to participate. The sample included 1226 5th and 6th grade students, representing 88% of all eligible children; 2% of parents opted out, and 10% were absent during data collection. The analytic sample for this paper included 940 students (77%). Students were excluded if they did not have survey data (N = 132) or standardized test scores (N = 134), or if they were missing data for >2 of 14 health assets (N = 20).

Data Collection and Measurement

Data were collected through the school district's administrative database, student surveys, and

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physical measurements. Data from school district administrative database included standardized test scores, physical fitness test scores, number of days absent during 2009-2010 school year, and demographic variables including age, race/ethnicity, sex, and qualification for free/reduced school lunch program—a proxy for family socioeconomic status. Student surveys were administered via desktop computer (Surveymonkey.com, LLC, Palo Alto, CA). Trained research staff read all questions and responses aloud while students entered responses into the online survey. Group administration facilitated participation for students with limited literacy. Surveys took approximately 30 minutes, and a backpack was given to each participant. Physical measurements were obtained by trained research assistants according to the World Health Organization (WHO) Expanded STEPS protocol.[27] Height was measured to the nearest half-centimeter using a standardized stadiometer (Charder Electronic Co., Ltd., Taichung City, Taiwan), and weight was measured to the nearest 10th of a pound using an electronic flat scale (Seca Co., Hamburg, Germany). All data were linked via school-assigned identification numbers to protect students' privacy.

Academic achievement was measured by standardized test scores on the Connecticut Mastery Test (CMT) and Connecticut Academic Performance Test (CAPT) for reading, writing, and mathematics.[28] The test was first used in 1986, and expanded in 2006 to comply with US federal requirements of the No Child Left Behind Act. Testing provides statewide performance evaluations to identify students' academic strengths and weaknesses. Validity and reliability are routinely evaluated by the Connecticut Board of Education.[28] Tests are statistically calibrated to minimize systematic errors, backed by years of data on state standards, item banking, and experimental studies.[28] On the basis of state standards, students were categorized as (1) below basic, (2) basic, (3) proficient, (4) goal (ie, grade level), or (5) advanced. Academic achievement is defined as whether students achieved ''goal'' or higher on all 3 tests.

A health index was constructed to include 14 diverse, modifiable and important health assets from 4 domains: physical health, health behaviors, family environment, and psychological well-being. Physical health measures were measured objectively and the rest were measured via survey. The final index was a simple additive score (range 0-14) with higher scores indicating more health assets (Table 1). The 14 health assets were divided into four subcategories and are listed below.

Physical health. (1) *Healthy Weight*: body mass index (BMI, kg/m^2) less than the 85th percentile according to Centers for Disease Control and Prevention (CDC) age-adjusted and sex-adjusted growth charts.[29] (2) *Physical Fitness*: met criteria for the Connecticut Physical Fitness Assessment program based upon tests of muscular strength and flexibility and aerobic endurance, mirroring the President's Challenge Physical Fitness Program[30]

Table 1. **Health Assets, N = 940 Students, Grades 5 and 6**

	N (%)
Health asset index (range: 1-13; mean = 7.14; SD = 2.15)	
Tertile 1 (low): 0-6 assets	351 (37.3%)
Tertile 2 (medium): 7-8 assets	345 (36.7%)
Tertile 3 (high): 9-14 assets	244 (26.0%)
14 items that make up the index	
Physical health	
1. Healthy weight (BMI < 85th percentile)*	482 (51.3%)
2. Passed state physical fitness tests	284 (30.2%)
Health behaviors	
3. Meets US Department of Agriculture recommended fruit and vegetable intake	30 (3.2%)
4. Consumes sugar-sweetened beverages ≤2×/week	475 (50.5%)
5. Meets physical activity recommendations (1 hour/day)	204 (21.7%)
6. Limits school day screen time to ≤2 hours	567 (60.3%)
7. Never tried smoking	901 (95.9%)
Family environment	
8. Eats a meal with family ≥5 days/week	525 (55.9%)
9. Eats a fast-food meal ≤1 day/week	532 (56.6%)
10. Food secure past 30 days	837 (89.0%)
11. Does not have a TV in the bedroom	163 (17.3%)
Psychological well-being	
12. Emotionally healthy (≤1 anxiety or depression symptom)	586 (62.3%)
13. Quality sleep (difficulty sleeping ≤1 per week)	610 (64.9%)
14. Feels safe in their neighborhood	515 (54.8%)

BMI, body mass index.

*Results did not differ when underweight students (BMI < 5th percentile) were included with the healthy weight students or excluded from analyses, nor did the underweight students differ from the healthy weight students in any systematic way. Therefore, to retain study participants and preserve statistical power, we included these students in the ''Healthy Weight'' category.

Health behaviors. (3) *Meets recommended fruit and vegetable intake*: based upon US Department of Agriculture (USDA) 2010 dietary guidelines[31] and assessed through student survey questions adapted from the WHO Health Behaviour in School-Aged Children (HBSC) survey regarding frequency and amount of fruit and vegetable consumption per day and week.[32] (4) *Less sugar-sweetened beverage consumption*: defined as consuming sugar sweetened beverages <3 days/week as assessed through the question: How many days per week do you usually consume sugar-sweetened drinks—like soda, sports drinks, or juice drinks? (adapted from the HBSC survey).[32] Because no standard guidelines for consumption exist, students were categorized according to the median split for our sample. (5) *Meets physical activity recommendations*: based on CDC physical activity recommendations for children (≥60 minutes/day)[33] as assessed though survey items regarding frequency and duration of physical activity (adapted from PACE).[34] (6) *Meets school day screen time recommendations*: based on American Academy of Pediatrics recommendation

to limit screen time to <2 hours/day.[35] Students answered the question: On school days, how many hours do you usually watch TV, play video games, and spend time on the computer for fun? (adapted from WHO's Global School-Based Student Health Survey[36]). (7) *Never tried smoking*: students' report that they had never tried smoking (adapted from WHO's Global Youth Tobacco Survey[37]).

Family environment. (8) *Family meal ≥5 days/week*: based upon the American Medical Association's recommendation[38] and assessed through a question regarding number of days in past week the student ate a meal with his/her family. (9) *Less fast-food consumption*: includes students who answered 0 or 1 day to the HBSC survey question: In the past 7 days, how many days did you eat at a fast-food restaurant?[32] Because no standard guidelines specific to fast-food consumption exist, students were categorized according to the median split for our sample. (10) *Food Secure*: includes students who answered ''no'' to a single food insecurity item adapted from the Child Food Security Survey Module:[39] Since school started, were you ever hungry, but didn't eat, because there wasn't enough food at home? (11) *No TV in the bedroom*: reflects the American Academy of Pediatrics' recommendation[35] and assessed through the question: Do you have a TV in your bedroom? (adapted from WHO's Global Adult Tobacco Survey).[40]

Psychological well-being. (12) *Emotionally healthy*: defined as having no more than 1 of the following symptoms in past 6 months weekly or more frequently: feeling down, irritability, or bad temper, feeling nervous, or feeling sad (adapted from HBSC).[32] (13) *Quality sleep*: defined as having difficulties getting to sleep no more than weekly in last 6 months (vs >1 per week or about every day), consistent with definitions for chronic sleep disorders that require both duration and frequency of sleep problems (adapted from HBSC).[32] (14) *Feels safe in neighborhood*: includes students who answered yes to a single survey item: Do you feel safe in your neighborhood? (adapted from Los Angeles Family and Neighborhood Survey).[41]

Analytic Methods

Analyses were conducted using Stata Standard Edition version 11.0 (2007; StataCorp, College Station, TX). All logistic regression models included the Stata ''cluster'' command to account for correlation within schools due to the school-clustered sampling design.[42] Bivariate associations between individual health index items and academic achievement were tested using unadjusted logistic regression. Multivariate logistic regression models were then estimated to examine the association between academic achievement and the health index, both as a continuous variable and separately as a categorical variable (split into tertiles), adjusting for sociodemographic characteristics, absenteeism, and school of enrollment. Note temporal ordering of measurement: health assets were measured in fall 2009, and academic achievement was measured in spring 2010. The analytic approach was adapted from a Washington State report on health and achievement.[43]

RESULTS

Description of Study Participants

Students age ranged from 9 to 13, with mean age 10.8 years (SD = 0.73). Students were nearly equally divided between 5th (51.2%) and 6th (48.8%) grade. Over one-half of participating students were girls (56.1%). Ethnic/racial background of students was 43.6% Hispanic, 40.4% African American, and 14.3% White. Most were eligible for the federal free (69.3%) or reduced-price (12.3%) lunch program.

Health Index

On average, students met 7.1 health assets out of 14 (range = 1-13; Table 1). Physical assessments revealed that 17.9% of children were classified as overweight (85th-95th percentile) and 26.6% as obese (≥95th percentile), well above national rates.[44] About 30% were physically fit, based on state fitness testing. Regarding health behaviors, few students met current recommendations for fruit and vegetable intake and physical activity: 3.2 and 21.7%, respectively. Regarding family environment, over one-half ate a family meal ≥5 days/week and at a fast-food restaurant ≥1 day/week. Only 17.3% report no television in their bedroom. Roughly two-thirds reported emotional well-being and minimal sleep disturbance. About 54% reported feeling safe in their own neighborhoods.

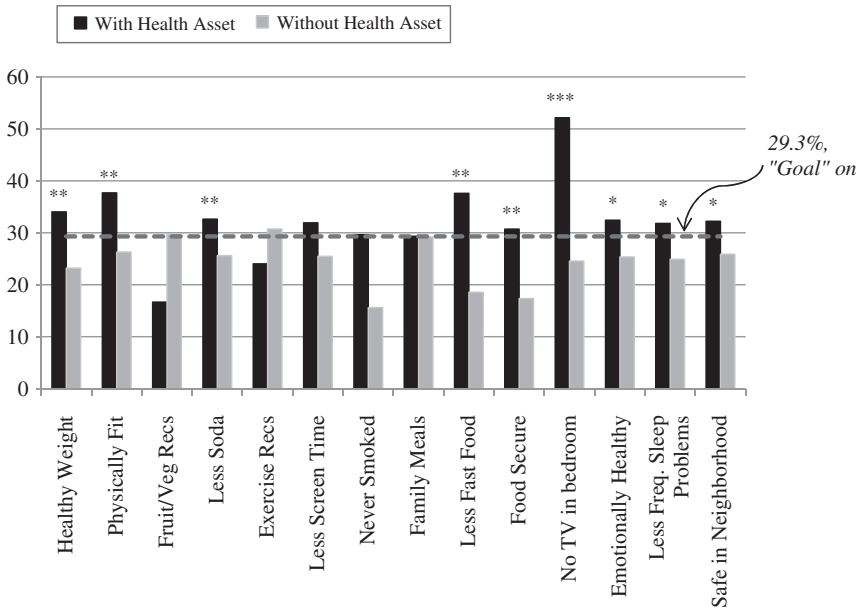
Academic Achievement

More than one-half of students achieved goal or above in each test area: reading, writing, and mathematics. However, only 29.3% achieved goal or above on all 3 CMT and CAPT test areas. This is comparable to other Connecticut urban school districts; however, it is far below statewide performance of 6th graders in which 54.7% of students achieved goal or above on all 3 tests.[45]

Bivariate Associations Between Health Assets and Standardized Test Scores

Figure 1 illustrates the proportion of students achieving goal on all 3 tests by each of the 14 health index items, with unadjusted odds ratios (OR) presented in Table 2. Physical health indicators—weight and fitness—significantly differentiated between those who achieved academic goal on all three standardized tests vs those who did not (all $p < .01$). Among

Figure 1. **Percent of Students Achieving Goal or Above on Reading, Writing, and Mathematics by Health Assets, N = 940 Students, Grades 5 and 6. Statistically Significant, *p < .05; **p < .01; ***p < .001.**



health behaviors, only less frequent consumption of sugar-sweetened beverages was significantly related to academic achievement ($p < .01$). Limiting school day screen time and never smoking were marginally associated with academic achievement ($p < .10$). Family environment is important: children who ate ≤1 fast-food meal/week, are food secure, and had no TV in their bedroom were significantly more likely to achieve testing goals (all $p < .01$). Finally, children who were emotionally healthy, had quality sleep, and felt safe in their neighborhoods were also significantly more likely to achieve testing goals (all $p < .05$).

Cumulative Effects of Health Assets on Academic Achievement

Regardless of any specific health asset, those with higher health index scores were more likely to achieve goal for all 3 standardized tests even after adjusting for race/ethnicity, sex, eligible for free/reduced-price lunch, absenteeism, and school of enrollment. Absenteeism and school of enrollment are associated with both health and academic achievement; however, after accounting for days absent and school, the association between health and achievement remains significant. As shown in Table 2, the model including the continuous health index scale demonstrates that each additional health asset is associated with an 18% increase in the likelihood of achieving goal on standardized tests (OR = 1.18, 95% confidence interval [CI] = 1.08, 1.29, $p < .001$), detecting a significant average increase on achievement conferred by a 1-unit increase in the health index. The categorized tertile index demonstrates more advantage to students meeting 9 or more health index items, such that children in the top tertile were 2.2 times more likely to achieve goal on all 3 tests compared with students with ≤6 health assets (OR = 2.17, 95% CI = 1.51, 3.13, $p < .001$). While 29.3% of the students overall achieved goal on all 3 tests, 47.1% of those with ≥9 or more health assets achieved goal, compared with only 21.9% among those with ≤6 health assets (Figure 2). The superimposed line in Figure 2 illustrates that as health index scores rise, the proportion of students who achieve academic goal also increases, with a particularly sharp upward slope for those with ≥9 health assets.

DISCUSSION

In August 2011, it was noted that nearly one-third of all US schools (31,737 of 98,916) missed proficiency goals for math and reading in 2009.[46] In turn, Secretary of Education Arne Duncan announced that he would override the cornerstone requirement of No Child Left Behind legislation that 100% of students be proficient in math and reading by 2014 (Public Law 107-110), for states that implemented their own testing and accountability programs and are enacting other measures to improve schools.[47] Results from this study indicate a strong relationship between students' health and academic achievement, suggesting that health-promoting behaviors should be considered nontraditional school achievement strategies with the

Table 2. **Unadjusted and Adjusted Odds of Achieving Goal or Above on Standardized Tests for Reading, Writing, and Mathematics, N = 940 Students, Grades 5 and 6**

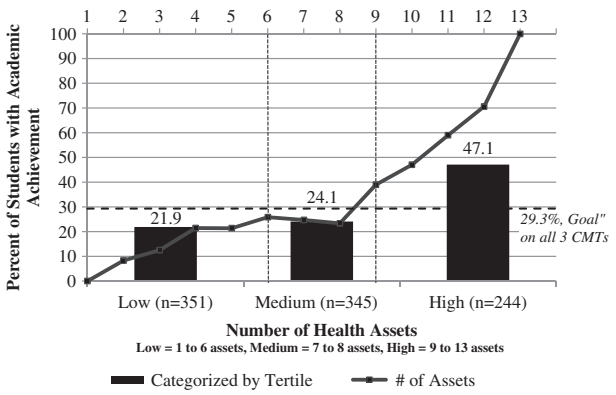
	Unadjusted OR† (Robust SE)	Adjusted OR‡ (Robust SE)	
		Continuous Index	Categorized Index
Health Index tertiles			
Tertile 1 (low): 1-6 assets	1.00		1.00
Tertile 2 (medium): 7-8 assets	1.03 (.20)		0.95 (.20)
Tertile 3 (high): 9-14 assets	3.01 (.73)*		2.17 (.19)*
Health index score	1.28 (.07)*	1.18 (.05)*	—
Race/ethnicity			
White/Other	1.00	1.00	1.00
Black	0.19 (.07)*	0.27 (.24)*	0.27 (.26)*
Hispanic	0.23 (.09)*	0.61 (.27)**	0.60 (.30)**
Gender			
Male	1.00	1.00	1.00
Female	1.70 (.31)***	1.52 (.21)****	1.49 (.21)**
Free/reduced lunch			
Is not eligible	1.00	1.00	1.00
Eligible	3.21 (.83)*	1.90 (.18)*	1.92 (.18)*
Absenteeism (number of days absent, 2009-2010)	0.95 (.02)***	0.96 (.01)*	0.96 (.01)*
Physical health			
Healthy weight (BMI < 85th percentile)	1.71 (.28)***		
Passed state physical fitness tests	1.69 (.24)***		
Health behaviors			
Meets USDA-recommended fruit and vegetable intake	0.47 (.23)		
Consumes sugar-sweetened beverages ≤2×/week	1.41 (.18)***		
Meets physical activity recommendations (1 hour/day)	0.71 (.18)		
Limits school day screen time to ≤2 hour/day	1.37 (.19)**		
Never tried smoking	2.27 (1.10)**		
Family environment			
Eats a meal with family ≥5 days/week	1.01 (.16)		
Eats a fast-food meal ≤1 day/week	2.65 (.71)**		
Food secure past 30 days	2.11 (.60)**		
Does not have a TV in the bedroom	3.35 (.76)***		
Psychological well-being			
Emotionally healthy (≤1 anxiety/depression symptom)	1.41 (.20)*		
Quality sleep (difficulty sleeping ≤1 per week)	1.41 (.21)*		
Feels safe in their neighborhood	1.36 (.19)*		

*$p < .001$; **$p < .10$; ***$p < .01$; ****$p < .05$.
BMI, body mass index; OR, odds ratio; SE, standard error.
All models adjust for school clustering; robust standard errors are reported.
†All assets entered into separate models.
‡Adjusted for race/ethnicity, gender, lunch eligibility, absenteeism and school of enrollment (not shown). Categorized and continuous index entered into separate models, individual assets not included in adjusted models.

potential to enhance both student health and academic achievement.

Results demonstrate that a multi-item health index—including physical health, health behaviors, family environment, and psychological well-being—is significantly associated with academic achievement as measured by subsequent testing success. Students with ≥9 health assets were 2.2 times more likely to perform at goal or above on standardized tests for reading, writing, and mathematics than students with ≤6 assets and each additional health asset was associated with an 18% increase in the likelihood of meeting academic achievement goals—even after controlling for important sociodemographics, absenteeism, and school of enrollment. We document a strong cumulative relationship between health and academic achievement (ie, ''more is better''). This extends findings of a prior report[43] via replication among a younger, urban, more ethnically diverse cohort of students and with the use of objective health and achievement indicators. Results suggest that schools and families should work together to ensure that students adopt a range of health-promoting behaviors to realize higher achievement. However, future research is needed to better understand the relationship between each individual health assets and any moderating factors that might affect academic achievement, including school and family environment.

Figure 2. **Cumulative Effect of Health Assets on Academic Achievement, N = 940 Students, Grades 5 and 6. Although the possible range for the health index score was from 0 to 14, the sample range was limited from 1 to 13 as no students reported no health assets or all health assets.**



We recognize that schools must prioritize academic achievement and that in the current school funding climate, health is often perceived as secondary, at best. However, results from this study and others indicate that creative approaches that integrate curricular and noncurricular school-wide efforts to promote healthy behaviors among all students are worth the investment. Examining the odds of achieving goal or above on all 3 standardized tests for each of the individual health assets, it appears that not having a television in the bedroom, being at a healthy weight and physically fit, being food secure, and eating at fast-food restaurants 1 time or less per week are the most important predictors of academic achievement in this study. Further, children who drink less soda and other sweetened drinks, are emotionally healthy, have quality sleep, feel safe in their neighborhoods, and are also significantly more likely to achieve goal on standardized tests. But beyond each individual health asset, it appears that any and all additional health-promoting effort cumulatively impacts academic achievement. Individual targeted initiatives may be insufficient to promote change; therefore, we must advocate against diffusion of responsibility (eg, just taking soda machines out of schools won't impact health or grades, so why bother) and for a more comprehensive approach.

Solutions must take a systems-oriented, multilevel framework that recognizes the importance of interventions and policies to alter contextual features in schools, homes, and neighborhoods.[48] Community- and family-based efforts coordinated with comprehensive school-based approaches may be essential to reduce disparities in both health and academic achievement. Many urban families sadly face the harsh challenges of persistent poverty. Health and social disparities, including academic achievement, are increasing. These disparities result in profound human, social, and economic costs. Those of low socioeconomic status, including low educational attainment, as well as people of color, are more likely to get sick from nearly all causes, and do so earlier in life, thus adversely affecting quality of life and ability to contribute to economic sustainability of families and communities.[49-51] We must recognize that improving education, employment, and housing may also be considered health-promotion strategies.[52] Woolf[53] suggested that correcting disparities in education-associated mortality could save 8 times as many lives as those saved by top medical advancements and treatments.

Limitations and Strengths

There are several limitations of this study. First, students were primarily poor and minority, and therefore, results are not generalizable to all students across the United States. However, this is also a strength of the study insofar as they represent students of greatest need. According to recent US data, of the >48.5 million students in public school nationally, 46% are eligible for free/reduced-price lunch.[54] Considering racial/ethnic background of public school students nationally, 17.0% are Black, non-Hispanic and 20.5% are Hispanic.[54] Therefore, whereas results of this study are not generalizable to all students, they may certainly be generalizable to many students across the United States.

Second, our measures were limited due to study focus and considerations of student confidentiality and burden. We were not able to include a comprehensive dietary assessment, nor did we have indicators related to other health risk behaviors (eg, substance use, bullying) or family or school climate. Importantly, we did not have any strong measures of social class such as household income or occupation; we were limited to a ''proxy'' measure of social class measured by free or reduced price lunch.[55] A priori, we wanted to create an index that would be easy for schools to use and interpret; therefore, we chose to dichotomize variables according to national standards and recommendations when applicable. However, this does reduce power by restricting variability. Nonetheless, separate analyses demonstrated the associations between health and academic achievement remained significant when the health index was categorized and when maintained as continuous.

In contrast, there are several notable strengths. Study participants represent an ethnically diverse, economically disadvantaged, urban population; thus results may be generalizable to other urban settings with persistent health and educational disparities. We used multimethod approaches including objective

indicators, standardized test scores, and student reported survey items. Data were temporally ordered, such that health assets were measured in advance of standardized testing. Finally, we included absenteeism as a potential mediator; while important, absenteeism did not diminish the impact of health on academic achievement.

IMPLICATIONS FOR SCHOOL HEALTH

Integration of health-promoting strategies can build on school districts' efforts to promote both learning and health. Potential benefits may outweigh the investment of time and resources. Murray et al[56] suggest that scientifically rigorous evaluations of school health programs are limited. However, there are evidence-based and promising programs/policies such as those designed to manage chronic conditions like asthma,[57] increase physical activity,[58,59] and healthy eating,[60] improve behavioral and emotional health,[61] or provide healthy school environments, comprehensive health education, and school-based physical and mental health services.[62] Other interventions might include implementation and enforcement of District Wellness Plan recommendations; establishment of school wellness teams to address health-related priorities; low-cost, school-wide strategies to promote positive school climate, healthy behaviors, and school connectedness; and before-/after-school programs to promote health and learning. Closing the ''health gap'' can help close the ''achievement gap.''

Human Subjects Approval Statement

All procedures were approved by the Yale University Human Subjects Committee and the New Haven Public Schools Board of Education. Ethical guidelines were strictly followed including parental consent and child assent in English or Spanish.

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